requiring a higher radiotherapy dose. A second consideration is the characteristic of the vertebral metastasis and divides the metastases into uncomplicated or complicated. A systematic review suggested the following working definition for uncomplicated bone metastases: those unassociated with impending or existing pathologic fracture or existing spinal cord compression or cauda equina compression. Although this definition looks straightforward it is still variable to interpretation and might be incomplete. The Spinal Instability Neoplastic Score (SINS) might help us estimate the risk of vertebral fracture limiting SBRT to stable and potentially unstable metastases. Different definitions of spinal cord compression are available with the minimum evidence for cord compression being indentation of the thecal sac at the level of clinical features. Finally, other aspects such as, primary tumour type, other metastases, symptoms, practical considerations, current systemic treatment and previous radiotherapy… should be taken into

TECHNICAL CONSIDERATIONS

For treatment simulation several options are available for patient immobilization. Independent of the system used, the patient must be positioned in a stable position capable for reproducibility of positioning, allowing the patient to feel as comfortable as possible. A typical CT scan length should extend at least 10 cm superior and inferior beyond the treatment field borders (slice thickness of≤2.5 - 3 mm). CT contrast will help visualize the soft tissue and adjacent normal tissues. The International Spine Radiosurgery consortium developed a consensus guideline for target volume definition. MRI images are mandatory for delineation. Axial volumetric T1 and T2 sequences without gadolinium are a standard with ≤3 mm slice thickness. Contouring of norm al tissue should be standardized for example: start contouring at 10 cm above the target volume to 10 cm below the target (RTOG 0631). Different fractionation schedules exist with variable total doses. None of the proposed schedules is proven to be superior to another. In case of single fraction, the doses vary between 16 and 24 Gy, with a strong trend for increasing pain relief with higher radiation doses, particularly with doses≥ 16 Gy. In case of fractionated radiotherapy, doses vary between 7-10 Gy for a 3 fraction schedule and between 5-6 Gy for a 5 fraction schedule. Most centers prescribe the dose (Dpr) to a % volume of the PTV. A PTV dose coverage of <80% of the Dpr should be avoided (RTOG 0631). This Dpr. should be prescribed to the isocenter or periphery of target. To minimize the risk for toxicity it is advised to strictly adhere to the published dose-constraints keeping in mind that they are mostly unvalidated. Control and correction of the patient and tumor position should be done with volumetric or stereoscopic X-ray imaging at least before each treatment fraction. Extensive recommendations and guidelines for a stereotactic or high precision QA program, supplementing the QA program for linear accelerators can be found in literature and should be followed (e.g. AAPM TG 101 report).

OUTCOME

The International Bone Metastases Consensus Working Party developed guidelines for the assessment of endpoints of palliative radiotherapy of bone metastases. It is recommended to follow the proposed definitions of pain assessment and pain response. Toxicity should evaluated at follow up visits using standardized criteria such as the National Cancer Institute (NCI) Common Terminology Criteria for Adverse Events (CTCAE) v.4.0.

Symposium: IMRT, the new standard in treatment of gynaecological, lung and breast cancers?

SP-0616
Organ motion: is it an obstacle to the use of IMRT as a standard technique for gynecological cancers?

I. Barillot[1]
[1]*Hôpital Bretonneau, Tours, France*

Intensity-modulated radiotherapy (IMRT) has been introduced in a number of disease in the late nineties for treating complex treatment volumes and avoiding close proximity organs at risk (OAR) that may be dose limiting. Fifteen years later, in many countries, IMRT is still not considered as a standard technique for treating gynaecological cancers. It is well accepted that, if reducing acute and chronic toxicity are the main endpoints, IMRT may be considered as the ideal technique. By contrast, if disease-related outcomes are considered, there are still insufficient data to recommend IMRT over three-dimensional conformal radiotherapy. Moreover, with the increased accuracy of treatment delivery comes the need for greater accuracy in incorporation of organ motion to prevent geographical misses.

Uterus significantly moves according to the bladder and rectal filling. The majority of motion occurs in the anterior–posterior and superior–inferior directions, with mean interfraction movements of 4–7 mm, but very large displacements up to more than 2 cm may occur with the inherent risk of poor coverage of the posterior part of the cervix or of the uterine fundus. Similarly, during post-operative irradiation, the vaginal CTV changes its position with standard deviation of 2.3 cm into the anterior or posterior direction, 1.8 cm to left or right and 1.5 cm towards the cranial. According to the majority of studies a uniform CTV planning treatment volume margin of 15 mm would fail to encompass the CTV in 5% of fractions in post-op. It rises up to 32%, when the CTV includes the entire uterus. For intact cervical cancer, where gross disease is present, the significant shrinkage in tumour volume of 62% in mean, also contributes to potential unintended doses to normal tissues, but the risk is rather low.

How to deal with motion uncertainties?

It can be helpful to attempt to control rectum and bladder filling, although the compliance with instructions for bladder filling and for rectal emptying does not always result in adequate reproducibility. The construction of an ITV from CT images acquired with empty and full bladder is also another way to account for interfraction motion of the CTV. The implementation of IGRT on a daily basis is essential for judging the effectiveness of the measures previously outlined. However, one must never forget that the cervix or vaginal cuff and surrounding tissues are mobile relative to the bony pelvis, while the pelvic lymph nodes which are also part of the target are relatively fixed. Thus, the shifts to account for motion of the mobile target may move the pelvic lymph nodes out of the PTV. Consequently, care should be taken when shifting to ensure that nodal targets are still within PTV, but keeping CTV to PTV margins to 10-15 mm helps to find a good compromise without jeopardizing the OAR's sparing. The risk of geographical misses does exist, but its level must be appreciated in the light of the dose contribution brought by the additional brachytherapy. Brachytherapy still plays a major role in the treatment of cervix carcinomas. The important dose gradient and the absence of target movements in relation to the inserted radioactive sources allow for dose escalation and 3D image guided adaptative procedure allows for accurate definition of target volumes with definition of dose volume parameters. Consequently a moderate under dosage of a part of CTV during IMRT may be compensated by the high dose delivered by brachytherapy.

The concept of adaptive IMRT seems to be applicable for the management of the complex deformable target motion that occurs during radiation of gynecological cancers. The cervix–uterus shape and position can be predicted by bladder volume, using a patient-specific prediction model derived from pre-treatment variable bladder filling CTscans. Based on that, a strategy called "plan of the day" has been elaborated and is under investigation.

In conclusion, organ motion is not an obstacle to the use of IMRT as standard technique for gynecological cancer, especially when combined with brachytherapy, provided that PTV margins are not reduced and IGRT is adequately used. The participation to prospective studies and/or the registration of patients in database are strongly encouraged.